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December, had fairly set in. On the 18th the freshes had raised the river some 4 or 5 feet. From the 20th to the end of December the rain was incessant, and on the 7th of January the river was 11 feet above its average level. This was the greatest height attained. There were, however, indications of its being a very dry season.

The weather during this time was very oppressive, and the excessive moisture rendered the heat most trying to our party, many of whom were actively employed.

By the end of January the rain had almost entirely ceased, and at the end of February the air had regained its usual dryness.

From March to July there was a constant succession of beautiful weather. The noonday heat seldom exceeded  $95^{\circ}$ , and was tempered by a delicious S.E. breeze, which blew uninterruptedly for nearly 5 weeks, and, with slight intervals, for 4 months. The days were bright and cloudless, the nights clear and cold, the thermometer generally below  $50^{\circ}$  at sunrise, sometimes below  $40^{\circ}$ . This weather had a most beneficial effect on us, and its influence was specially felt by those of the party who were for so long a time resident in camp at one spot, and without any active employment or exercise.

After the end of June, when the party left the Victoria, our movements were so rapid, and the climate so constantly affected by external circumstances, viz. elevation, proximity to the sea-coast, &c., that no general results could be obtained.

We were in the neighbourhood of the Albert River during the same month (August) as both Captain Stokes and Dr. Leichhardt. Our experience was limited, but confirms their report of the excellence of the climate during this (the cool) season; but I should expect that the same cause that produces the mildness in the cool season, would produce a contrary effect during the hot months of the year.

I must refer to the Meteorological Journal kept by me, and now on board the *Messenger*, for a more extended and detailed account of the climate of N. W. Australia.

I have the honour to be, Sir,

Your obedient servant,

J. R. ELSEY, F.R.G.S.,  
Surgeon to the N. A. Expedition.

To A. C. Gregory, Esq., Commanding  
N. A. Expedition.

## II.—Notes on the Physical Geography of North-West Australia.

By Mr. JAMES S. WILSON, Geologist to the North Australian Expedition.\*

Communicated by SIR RODERICK I. MURCHISON, President.

Read, May 10, 1858.

PREVIOUSLY to the period of our expedition it was generally believed that North-West Australia possessed a lofty range of mountains, which idea was supported by a statement found in the Journal of Dr. Leichhardt to the effect, that the portion of the great table-land which he crossed, on his way from the head

\* See 'Proceedings,' Royal Geographical Society, p. 210, vol. ii.—Ed.

waters of the Roper River to the sources of the South Alligator, was 3800 feet in elevation. After I had examined the table-land that bounds the valley of the Victoria River, and compared my observations with the notes transmitted to us by Leichhardt, relative to the table-land of the South Alligator, and seeing that the cliff-formed front of that table-land, as described by him, ran in a direction to meet the Newcastle Table-range, I concluded that they were continuous, ranging from 700 to 800 feet above the sea, and that the elevation given in Dr. Leichhardt's Journal was an error of the printer. This I communicated to Sir Roderick Murchison, and it appeared in your 'Proceedings,' vol. i., p. 230, January, 1857. The report given by Mr. Gregory of his subsequent journey from the Victoria River to the Roper confirmed my anticipations.

It is now quite certain that a continuous table-land extends through all North-western Australia, the summit of which runs parallel with the main bearing of the coast, from Melville Island to Roebuck Bay. From evidence that presents itself, I feel satisfied that it extends to the higher land of Western Australia, and that Cape Wessel at the n.e., and Cape Leeuwin at the s.w., are the extreme ends of the dividing ridge, passing between the sea and the interior desert.

The rocks composing this table-land are of the class termed paleozoic, and (with the exception of a few beds of trap and an occasional prominence of granite) belong to the carboniferous era. They may be divided into four series of strata: the uppermost of these is a thick bed of red sandstone in thin strata and generally topped with iron ore in various stages of oxidation. Under this lies a thick compact bed of siliceous sandstone, scarcely showing a trace of stratification, and generally exceeds 100 feet in thickness. It is sometimes (as at Sea Range) divided into two beds, and between the two is a space of about 100 feet, occupied by softer whitish stratified sandstone. These siliceous rocks I consider to be in their order identical with the Sydney sandstone, which in New South Wales overlies the coal-bearing strata of shale. The third rock in the descending order is shale, or clay slate, that decomposes rapidly when exposed to atmospheric influences. It is generally of a bluish colour, but when decomposed forms a reddish clay, which becomes a very productive soil. Under the shale limestone appears: its thickness is unknown. It is frequently covered with a stratum of jasper, varying from a few inches to 60 feet in thickness, and frequently has the appearance of a silicified coral bed.

Though this is the order in which these rocks are placed, they are not all continuous, as for instance, the limestone rock frequently rises to a height which the shale (though higher in the order) does

not reach, and is in such places wanting. The sandstone, however, observes a more even and continuous bed than the lower rocks of the system. This difference arises in consequence of the latter having been deposited on a rather uneven surface of the older rocks, while currents, and the action of the waves combined, rendered the surface that should receive following deposits more even.

As a result apparently arising from this levelling process, these rocks generally blend with each other at their lines of junction, excepting the ferruginous and siliceous sandstone. Thus, the limestone passes by degrees into shale, and the shale into the lower sandstone; but the siliceous and ferruginous sandstone rocks, though laid in close contact, have their line of junction clearly defined.

The general dip of all these rocks is to the N.W., or from the dividing ridge to the sea, so that the top rocks have passed under the sea near to its present margin. The dividing ridge may be reckoned at a mean distance of 300 miles from the coast, and is estimated by Mr. Gregory to be 1600 feet above the sea, which would determine the average slope of the table-land to be little more than 5 feet per mile.

These rocks were deposited by the sea during various periodical submergences; but since that period the sea has, at various elevations (inferior to that under which the rocks were deposited), exerted a degrading influence on the table-land. The ferruginous sandstone being uppermost, and its metallic component being readily oxidized by exposure to the atmosphere, the disintegrated portion was continually removed, first by rains producing streams, and secondly by the action of the waves and currents during each overflow of the sea, the material being drifted to lower levels, where, in deeper water protected from the action of the atmosphere and waves, the rock was partially reproduced in those soft, red, sandstone strata that skirt the north-west coast, and may be considered as belonging to the tertiary period. They are the base of those low plains that, to a great extent, border the sea margin of the table-land. The Plains of Promise are of this formation. So also are most of the islands at the head of the Gulf of Carpentaria, as well as the Coburg Peninsula and the plains along the coast from thence to Point Pearce, extending back from the latter place to the Macadam Range. The same formation has been observed much farther to the S.W. by Captain Stokes, and indeed those vast low plains extending from Roebuck Bay far to the S.W. are a continuation of the same deposits.

This formation yields generally a poor, ferruginous, gravelly surface soil, which has produced an unfavourable opinion of the fertility of the country upon the minds of navigators and others who have visited the coast. It is, however to a considerable

extent covered with a productive alluvium yielding an abundance of grass, while the timber on the poorer portions of it is superior to that found in the richer valleys farther south.

I have already remarked that the rocks composing the table-land (with the exceptions already stated) are all marine deposits, and during the period of their formation have been frequently and completely submerged. I shall here add, that after the uppermost stratum had been deposited these overflows continued, and are repeated to the present time, but gradually declining in elevation ; as for instance, the overflows of the sea during the carboniferous era in Australia exceeded 2000 feet above the present level ; those that prevailed during the tertiary period did not exceed 400 feet, and an equally great decline is observable in the deposits of recent date, as for example : in a section of the alluvial banks of the Lower Victoria, raised not more than 6 feet above high-tide mark, I observed nine beds of river deposit, each separated from those above and below by a thin stratum of vegetable mould, containing vegetable remains, thus indicating so many recent submergences. The same process is still going on at lower levels along the present banks of the river.

This declining elevation in the succeeding order of the overflows of the sea produced a gradually denuding influence, wearing away the rocks that had been deposited by the deeper inundations, so that, of the upper or ferruginous sandstone, that was 300 to 400 feet in thickness, vestiges (comparatively) only now remain. When this was removed the compact siliceous rock that lay under, and which now forms the surface of the many flat-topped hills and ranges, protected the softer shale and limestone rocks that lay beneath, and by its dipping to the lowest sea-level presented a hard and impenetrable barrier to the waves, except where intersected by rivers which have furrowed out their courses, both during the periods that intervened between the submergences while that rock was in course of formation, and since that time. The sea at times of submergence entered these ravines, and the waves acting on the then exposed soft under rocks, hollowed out those extensive plains\* that now run parallel with the dividing ridge and the coast, though separated from the latter by detached masses of the table-land presenting cliff-topped ranges on their landward side ; such is the character of that plain-like valley of the rivers, Norton Shaw, and Saunders, which is bounded on one side by the Mur-

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\* The denuding process can be observed going on at the present time at the head of nearly every creek tributary to the Victoria, and, indeed, all along the front of the cliff-topped ranges, where water, falling over the face of the hard siliceous rock, or percolating through from underneath it, removes a portion of the soft shaly rock from below, and allows the upper hard rock to break off of its own weight, and to fall over into the gulf below, where, in its broken state, exposed to the weather, it is in time disintegrated and removed by the floods.

chison and Sea or Ellesmere Range, and on the other by the Newcastle Table-range, extending s.w. into open plains, which probably are continuous to those plains seen by Captain King, extending s. from the head of Cambridge Gulf. Of such character also are the jasper plains of the Upper Victoria.

The soil on these plains is a rich clay, frequently very deep, and is derived from the decomposition of the shale rock after being left bare by the removal of the sandstone. The limestone frequently protrudes, and in such localities the soil is more calcareous.

Trap plains occur in the higher part of the table-land. This rock is generally of more recent date than the sandstone, and seems to have flowed over depressions, or hollows, worn out of the latter. It is extensive on Roe Downs, occupying 60 miles from e. to w., and computed by Mr. Gregory to extend over a million acres. The jasper plains contain about 320,000 acres; Beagle Valley, with valleys adjoining, 160,000; and the extensive valley of the Norton Shaw and Saunders rivers it would be difficult fully to estimate, but there appeared under my own observation an extent exceeding 1,500,000 acres, to which if we add the fine country at the head of Sturt Creek and that at the head of the River Fitzmaurice, they will make an aggregate exceeding 5,000,000 of acres. These tracts have come under our united observations, and may all be considered well-watered pasture-land. In addition to these there is an area extending 60 miles in each direction, occupying the seaward slope from the Murchison Range. It has only been seen from the river, and from the summit of the range, and been penetrated only a few miles; but from the slight observations I have been able to make, I consider it to be possessed of a considerable amount of good alluvial land, while nearly the entire district is fit for pasture. To the westward of the Murchison Range grassy plains extended beyond the reach of my telescope, from the highest part of the Newcastle Table-range, and I believe they extend in that direction to Cambridge Gulf.

North-West Australia is in reality a grassy country. In no part of the world have I seen grass grow so luxuriantly, and Mr. H. Gregory observed to me during a journey of ten days, when I accompanied him and his brother to the Upper Victoria, that he had seen more grass land than during all his life before.

Hitherto my remarks have been more particularly directed to that portion of the seaward slope occupied by the valley of the Victoria, which cannot be supposed to claim more than 100 miles lineal extent of the coast; but if we include that which is brought to our knowledge by the research of those other explorers who have laboured in the same field, Captain King up the Liverpool River and Cambridge Gulf, Dr. Leichhardt in the valley of the South Alligator, Captain Stokes up the FitzRoy and Adelaide Rivers, and

Sir G. Grey in the valley of the Glenelg, we may regard the seaward slope of the great table-land as presenting generally similar features at nearly corresponding distances from the coast. Such conditions, carefully considered, will convey some idea of the vast extent of that country suitable for the occupation of a civilized community.

Perhaps on no part of the coast of Australia of equal extent are there so many navigable rivers as on that of the N.W. Commencing with the FitzRoy, Captain Stokes ascended that river with his boats to the distance of 22 miles in a general S.S.W. direction, having then penetrated 90 miles from the coast line. The Glenelg, discovered by Sir G. Grey, is probably an equally important river, but its entrance being still unknown, we are ignorant of the extent of its advantages. Within 50 miles N.E. from the latter, and running a nearly parallel course, the Prince Regent River falls into Brunswick Bay. Cambridge Gulf afforded Captain King an opportunity of penetrating the country there to a distance of 60 miles from the coast line, but he did not explore the river that falls into the head of the gulf. The River Adelaide, explored by Captains Wickham and Stokes in boats to the distance of 90 miles, was reckoned by them to be navigable for vessels of four to five hundred tons for 50 miles, and into fresh water—the South Alligator appears also to be equally navigable.

The Liverpool River was ascended by Captain King in his boat to the distance of 30 miles, being fresh water the greater part of that distance. That the River Victoria is navigable is evident from the fact, that the schooner *Tom Tough*, while under my charge, was brought up to our camp, a distance of 100 miles from Point Pearce, and might have been taken some 8 miles more; but although we succeeded in sailing the schooner up so far, I do not think it safe, in the present state of the river, for sea-going vessels to venture farther up than Blunder Bay.

In the description given of Cambridge Gulf by Captain King, I find that he observed the water to be muddy at the head of the gulf as though brought down by a river, but remaining quite salt. His visit there was during the dry season, when most probably no fresh water flowed into the gulf. Similar phenomena observable in the River Victoria may explain the cause, which I shall describe as it appeared under my own eye in that river. At a place named the Musquito Flats by Captain L. Stokes, a series of shoals composed of fine sand and mud commence, and extend up the river a distance of about 12 miles. We named them the Gourlay Shoals in respect to our sailing-master, who was the first to run a ship on them. At this place the river becomes very broad and shallow. The broad flat sandbanks, at low tide, stand about 2 feet above the water that then occupies the broad shallow channels that wind

amongst them; but at full tide they are covered to a depth of 4 to 7 feet. One of these shoals that I measured was 2700 feet in breadth. During the rainy season the floods bring down the Victoria, and its great western tributary the Norton Shaw, large quantities of mud and sand, and these rivers meeting simultaneously with the tide water at this broad place, cause a temporary inertia during each flow of the tide, when much of the sediment carried down by the floods is deposited on the shoals, and to such an extent, that during the season when we were there some of these shoals increased in height about 2 feet. But when the fresh water ceases to flow the tide ascends the river with greater force, and passing with a bore across the shoals stirs up the sand and mud, a large portion of which is carried down with each ebb. I have observed this muddy water passing round Point Pearce in the direction of Clarence Strait, producing a muddy bottom in that direction, and to this same cause we must assign the origin of those muddy islands and banks, distributed along each side of the estuary of the Victoria, and the annual accumulations will in time confine the water to what is called Queen Channel.

Though the climate of North-West Australia is rather too hot to be comfortable for at least six months of the year, our health was by no means impaired by it, and the months of May, June, and July were really pleasant. The following is the mean or average temperature, obtained from observations taken in the shade, and registered at our camp on the Victoria in lat.  $15^{\circ} 30'$  s., from November 1855, to July 1856, inclusive, for each month, at 6 A.M., 1 P.M. and 6 P.M., to which is added the maximum and minimum of heat, and the number of days on which rain fell during our stay there.

	Mean Temperature at			Max.	Min.	Rainy days.
	6 A.M.	1 P.M.	6 P.M.			
1855 October .. ..	o	o	o	o	o	1
November .. ..	81.0	100.0	93.0	106	69	12
December .. ..	79.0	94.0	87.0	105	73	20
1856 January .. ..	78.0	94.5	86.0	104	71	15
February .. ..	78.3	92.3	86.5	99	75	19
March .. ..	79.3	96.0	89.5	102	75	8
April .. ..	75.3	91.2	85.3	98	69	6
May .. ..	66.6	91.8	84.7	96	60	0
June .. ..	59.0	84.4	77.5	97	47	3
July .. ..	59.0	87.0	80.0	97	49	0
..	..	..	..	..	..	84

The maximum temperature in the shade shown by this Table is  $106^{\circ}$ , and the minimum  $47^{\circ}$ ; but observations extending through



the night show the average, an hour before sunrise, to be about  $2^{\circ}$  less than at 6 A.M., or when the sun has risen.

From observations registered by Mr. Flood for the months of February, March, and April, at a depôt established by Mr. Gregory on a branch of the Upper Victoria, 90 miles farther s, I obtain the following means :—

	Mean Temperature at			Max.	Min.
	Sunrise.	Noon.	Sunset.		
	○	○	○	○	○
February	72	94·6	86·5	99	68
March ..	72·6	97·8	88·3	101	68
April ..	75·1	90·3	83·6	98	60

In this we see an approximation to the temperature for the same months in the preceding Table, the greatest difference being, that the mornings during February and March were  $6^{\circ}$  colder than at the camp where I was then stationed.

The thermometrical observations for the month of December, 1838, and the following January, by Sir G. Grey, at Hanover Bay, in a nearly corresponding latitude with our camp, approximate very nearly with these Tables. The means that he records are as follows :—

	6 A.M.	9 A.M.	12 M.	3 P.M.	6 P.M.	9 P.M.
	○	○	○	○	○	○
December	82·2	85·3	91·3	90·2	85·8	
January	78·2	84·3	83·1	85·7	80·7	83·4

If we take the mean of these mean temperatures for 6 A.M., 3 P.M., and 6 P.M., and compare them with the mean of the temperatures for 6 A.M., 1 P.M., and 6 P.M. at our camp, I find that the mean temperature for a day at Hanover Bay, in the month of December, 1838, was  $86^{\circ}·7$ , and at our camp for the corresponding month of 1855 was  $87^{\circ}$ ; but the difference for the month of January is much greater, that at Hanover Bay being  $81^{\circ}·5$ , and at the Victoria  $86^{\circ}·2$ , showing a difference of nearly  $5^{\circ}$ . This greater difference in the latter month, I think, is due to the western monsoon, which is at that time of the year set in and blows at Hanover Bay, but hardly reaches the Victoria, where we were encamped. This difference may continue as long as the westerly monsoon prevails. But although the mean of the day is cooler at Hanover Bay, the night seems to be warmer, as the Table represents the mean temperature for 9 P.M. as being higher

than the noonday, noon being  $83^{\circ}1$  Fahr., and 9 P.M.  $83^{\circ}4$ . This apparent anomaly may possibly be traced to local causes.

The number of days on which rain fell during the months of December, January, February, and March, at Hanover Bay, is stated by Sir G. Grey to be 44. By referring to the preceding Table for the Victoria, I find that during the corresponding four months the number of days on which rain fell was 62.

I have said that North-West Australia is a grassy country, and this character is due, not only to the great abundance of grass with which it is covered, but also to the luxuriance and variety of the grasses. A few of these, however, are predominant, and in most instances afford excellent pasture. Perhaps the most extensive is a variety that resembles wild oats, and grows to the height of from 3 to 6 feet. This grass acquires its greatest perfection on the stony slopes and at the base of the ranges. It grows in many places on the top of the table-land, and on dry gravelly patches. Bordering this grass, but on better soil, another variety growing close and fine, and not often exceeding 3 feet high, might make excellent hay. This grass covers extensive tracts on the plains, and when ripe it is very difficult to travel through on foot, as it lies, broken by the wind and parted from its roots, in a tangled mass, a foot to eighteen inches deep, and clings round the feet and legs while passing through it.

On a rich alluvial soil occupying a still lower situation than that producing the grass last described, and subject to slight inundations, a gigantic grass is produced which acquires a height of 8 to 12 feet. The extent of country it covers (though considerable in places in the vicinity of the rivers) is small when compared with that of the preceding varieties. Other kinds of grass occupy large areas, of which it is not necessary on this occasion to treat further, than to say that they nearly all afford good pasture. There are also extensive beds of reeds growing along the rivers, of which our horses were exceedingly fond while they remained green.

The timber in the valley of the Victoria, though suitable and sufficiently abundant for the rough structures of a first settlement, cannot be said to be good. It consists principally of eucalypti, but far inferior to trees of the same order in the south. One variety (*melaleuca*), growing along the margin of the rivers or in swamps, with drooping foliage like the willow, would afford good timber to a limited extent. The lower plains along the coast seem to afford the best timber. Mr. G. W. Earl, in his history of the Port Essington Settlement, states that there are tracts of country on the Coburg Peninsula that produce good timber of an Indian character, and names several trees as identical with some that grow in the Eastern Archipelago. And Sir G. Grey represents

the valley of the Glenelg as possessing eucalypti and pine in abundance, and of large proportions.

The indigenous fruits are more numerous, and superior to those of Southern Australia. Among these are three varieties of fig, which are all well flavoured, when they can be found unattacked by ants, which penetrate the fruit and extract all the saccharine juice. There are two varieties of fruit resembling grapes growing in clusters: one is produced by a vine that climbs the trees, and is (I believe) a true grape vine; the other on a plant that requires no support, and dies off annually. The latter is very abundant on the slopes of some of the ranges, and bears a very agreeable fruit resembling in form and flavour a small purple grape. We could get very few of them, as the birds, or other animals, seemed to devour them as fast as they ripened, and the natives also appeared to frequent at that season the localities in which that fruit grew most abundantly. The plants shoot up very rapidly with the early rains, 4 to 6 feet high, and during that time resemble the tender shoots of a grape vine. The ship's cook frequently collected it while in that stage, and used it for puddings in the manner that rhubarb is used in England. The fruit of the *Adansonia*, or gouty stem tree, was used freely by us. The mode of preparation we adopted was to roast the whole fruit in hot embers, then break off the shell and mix the pulp with sugar. After the pulp became dry, when the fruit might be considered fully ripe, we could no longer use it in the way stated. I perceived that it had then acquired a peculiar acid flavour, and the idea occurred to me, that the use of this fruit might be rendered beneficial to the sailors on board the schooner, who from a more constant use of salt provisions than the men of the land party at the camp, and even of a much worse description, were all more or less suffering from the attacks of scurvy, which the best efforts of our surgeon could not arrest. I collected some of this fruit, and taking it aboard to the Captain's wife (who was herself a sufferer), recommended her to have the pulp grated down to a powder and boiled with sugar as a jam. My advice was attended to, more fruit was daily collected, and an agreeable jam made of it for all hands; and I had the satisfaction to observe that all those who were attacked by scurvy only were completely recovered when we left the River Victoria to proceed to Timor. The wood of the *Adansonia*, though very large (measuring frequently 35 feet circumference), is very soft; its fibres are very white and have a silky appearance; they are very readily drawn apart by the fingers, and I judged it a very suitable material for the manufacture of white paper. On several occasions when in want of water, I and my attendants allayed our thirst by chopping a piece of wood from the side of one of these trees, and taking the chips expressed the sap with which the fibres

were completely saturated by chewing the wood, the taste of which was like a sweetish water.

Perhaps the most interesting indigenous production found by us, because affording food for man, and representing the fitness of the soil and climate for its cultivation, was rice. It was found simultaneously by our botanist Dr. Mueller (I believe) at Sturt Creek, and by myself in a swamp by the River "Norton Shaw." I am of opinion that the natives collect the rice for food, as the margin of the swamp was very much trodden by them, and the ears pulled off the plants, leaving only those of inferior description remaining. Of this I am still further convinced by the circumstance that some weeks after this discovery, while I and my party were at breakfast one morning on Sandy Island, we were joined by the old native Deeanna with whom we had already formed a little intimacy. Having given him some bread and tea, he enquired by signs what the bread was? In answer I took some seed from a tuft of grass growing by where we sat, and placing it between two stones, rubbed it and showed him the flour; immediately he saw me adopt this operation he expressed his satisfaction as though he understood it perfectly.\*

Wild yams were found by us, and used when such opportunities occurred: they were of course, in their uncultivated state, very small. Along the banks of the Victoria another plant, resembling the potato plant, grew abundantly, having a large root somewhat like a yam, or resembling more particularly that called *tarro* at the Sandwich Islands; it is used for food by the natives. Some roots were dug up by our men while employed in making the ditch round our camp; they cooked and tried to eat some, but found it too acrid. I have no doubt that if it were treated in a manner similar to that adopted with the *tarro* by the Sandwich Islanders, or reduced to the state of a starch, it might be rendered valuable.

A small, but rather pretty tree, producing cotton, was found growing on all the varieties of soil in the valley of the Victoria, but seemed to prefer stony slopes. This tree appears to have a very extended range. It was found by Sir G. Grey at the River Glenelg, and by Dr. Leichhardt along the Gulf of Carpentaria. I saw the same tree growing on the Island of Timor, and was informed there that the cotton was collected to stuff pillows, &c.

The birds and quadrupeds generally are similar to those found in Southern Australia. The Kangaroo and Wallaby were found by us, but they are neither so numerous nor so large there as in the south, while the opossum, if not altogether wanting, is very rare. Being familiar with the habits of this animal in the south, I searched for the scratches which it makes on the bark of the

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\* I presented a small sample of this rice to Sir W. Hooker, at Kew.

gum-trees when climbing, but without success. Several other animals known in the south were not met with here. The native cat was found, and the wild dog was frequently seen, and is a larger and finer looking animal than the dingo of the south. Rats we found both numerous and troublesome. Of birds, the black and the white cockatoos, bronze-winged pigeons of several varieties, and the bustard (or wild turkey of the colonists), were all found in the Valley of the Victoria, but they were all much smaller than their kindred of the south. The laughing jackass (or gigantic king-fisher) is found there also, but like the rest is a degenerate bird. Parrots were rather rare. To balance these deficiencies, however, a kind of rose-coloured cockatoo appeared in the dry season very numerous; there are several varieties of ibis, two or three kinds of ducks, one of them called the whistling duck from its singular shrill note; it and another species are also called wood ducks because they perch in the trees. Geese were sometimes seen, and another waterfowl, nearly as large as the goose, and commonly called a shag, was found at certain seasons in considerable numbers. Many other varieties of waterfowl were got, and some of them very beautiful.

Large bats, nearly as large as the flying fox of Eastern Australia, but grey in colour, were in great numbers, and always found in societies; we had seen them frequently from early in the month of November till April; I judged them to be migratory, from the circumstance of having seen a gathering of them at noon on the second day of the latter month, extending about a mile along one of the reaches of the Victoria, some millions in number, flying in circles overhead; they darkened the air, while multitudes perched on the trees and bushes caused the branches to bend down under their weight. They reminded me of the flights of wild pigeons I had seen in North America. I was under the impression at the time that they had collected there for the purpose of a general migration, but the duty on which I was then engaged would not allow me to wait and observe the direction of their flight. We never saw them again, though we were in that locality for nearly four months after. Some of our people tried this animal as an article of food, and probably it would have been liked had it not been for a musky smell and taste, added to the prejudice existing against it from its having obtained, deservedly or not, the name of vampire. They frequently passed in flights over our camp at night while they remained in that locality, and on such occasions the musky smell attending them was perceptible. I am not certain whether our naturalist enquired into the habits and nature of the food of this animal. My own impression is that it feeds on fruits and berries, especially the grape-like fruit that I have described. The season for these being past might account for their migration.

Sir G. Grey mentions having seen considerable numbers of kangaroos in the Valley of the Glenelg, but mentions also that the country was well wooded with eucalypti and pine, and in this may be discovered the cause why these and other animals are few in the Valley of the Victoria. The difference does not argue in favour of a better soil or more temperate climate ; the dissimilarity in the latter, as I have to some little extent shown, is but trifling, but the presence of shady trees in the one place, where these animals can find shelter from the fierce heat of the midday sun, and their comparative absence in the other, will make the district of the Glenelg a favourite haunt, while such tracts as the Valley of the Victoria are avoided. Mr. G. W. Earl mentions that the favourite haunt of the kangaroos in the Coburg Peninsula (which is much nearer to the Equator) is the vicinity of those patches of Indian vegetation to which I have already alluded. Agreeably to these facts, Western Australia, with its sandy soil producing little else than scrub and forest, abounds with kangaroos. This abundance will perhaps be best represented by a little matter of business, told me by a merchant at Adelaide who obtains large quantities of timber from Swan River for the construction of the railways now in progress in South Australia. A dealer offered him one thousand kangaroo skins at 9*d.* each, and he declined the bargain because there was one shilling export duty chargeable on each of them. Another account given me while I was at King George Sound, was to the effect that some of the settlers in Western Australia employ the aborigines in hunting kangaroos for the purpose of exporting their skins, and feeding pigs on their flesh. From these facts it will appear that Western Australia with the poorest description of soil is nevertheless rich in timber and kangaroos.

Fish is plentiful in the Victoria, and several kinds were caught by us. The most plentiful is a variety called cat-fish ; it is of a very rich description, but was nevertheless rejected by our people at first in consequence of the cook (a West India negro) having said that it was not considered good in his country. This fish makes a singular trumpeting noise, both while it is in the water and after it has been landed (a circumstance which proves that sound can penetrate water, and also that water will conduct sound). It is armed with a strong sharp spine 2 or 2½ inches in length, that stands perpendicular from the back, and if the fingers get pricked with this it causes a stinging sensation. It would seem that in consideration of its being sluggish and incapable of rapid movements it is compensated with this defence, by which it is rendered a dangerous morsel to its enemy the alligator. Another fish about a foot in length, to which our people gave the name of skip-jack, would, when pursued in the water, take to the surface,

and by a few rapid bounds would cross the river. We never caught one, but a much smaller fish of a similar description we sometimes got by shooting them with bird shot. This variety went in little shoals, with their heads partially above the surface, and seemed to prefer the shallow water about the sandbanks. Bream of a moderate size was easily obtained where the bottom was stony, and was much sought for by our people. A pretty little fish of a yellowish colour, with dark broad streaks across its sides, and in size about that of the common perch, seemed to be a fly-catcher; I have often observed it take its winged prey in what seemed a rather amusing manner. Where the mangrove bushes grow up from beneath the water at the river's edge, this fish takes its position underneath, and when a fly alights on an overhanging leaf, it sends up a little jet of water to the height of 2 or 3 feet directed at the fly, which if struck falls to the surface and is caught. This fish was frequently caught at the side of our ship by a hook and line baited with a cockroach, and on being opened was commonly found to contain a large number of cockroaches; these insects, it appeared, went down outside the ship at night to drink, and were caught by this fish. There was also a large fish which our cook called a jew-fish: it is from 18 inches to 2 feet in length. We could hear them at all hours of the night springing out of the water and falling back on its surface. The only time this fish came under our immediate inspection was on an occasion when one of them leaped into our boat and so got caught. There were many other species of fish in the river, but these mentioned were the most numerous, and, as affording an article of food, are the more important. There is, however, one little fish that in respect to its singularity deserves some notice (if indeed the term fish can properly be applied to an amphibious or air-breathing animal). It is mentioned by Captain Cook and Captain King as having been seen by them on other parts of the north coast. It is about  $2\frac{1}{2}$  inches long, its head is considerably elevated and rather large, the eyes prominent; it uses its front fins as feet in walking on the sand or over rocks, in which endeavour it drags the after part of its body. When it requires to move more quickly it leaps from stone to stone a distance of 2 feet or more, and can bound across the surface of the water in the same way. We never found it in such parts of the river as are occasionally fresh.

The natives of the Valley of the Victoria are not numerous, the cause of which may be traced to that already stated as affecting the distribution of animals in Australia. They are easily identified with the aborigines of the south, and differ physically only in being generally slighter and the hair more crisp. Their colour is a brownish black, their hair crisp and black but not glossy, and in this respect they resemble some natives of the interior of Timor that

I had seen at Coepang; they have less beard than the men of the south, but of that little they seem to be exceedingly proud; they ornament it by fixing kangaroo teeth to the extremities, and on one occasion I saw a young man with the tip of a kangaroo's tail gummed on to his beard to increase its length. The men of some of the tribes have two of the upper front teeth broken out, and this gave some of the old men a rather singular appearance, as it seemed that the teeth on each side of this breach wore away, and allowed the lower front teeth to pass considerably up into the vacant space. Other tribes (who do not remove the front teeth) grind the top edge off all their teeth so as to bring them to an even surface line. A Jewish rite, that has been observed to prevail amongst the natives of other parts of Australia, is practised by all these tribes; they likewise mark themselves with large raised scars across the chest; they wear no clothing save a belt of cord made of animal hair drawn twenty or thirty times round the body and the two ends secured; this the native slackens when he has got plenty to eat, and draws it tighter as he feels hunger pinch him. On one occasion I saw two young men, who had each a bunch of long feathers suspended from his belt by way of an apron; and at a camping place that seemed to be selected for the wet season, I found beds made of bark, and what I supposed to be a kind of cape. It was made of long grass fastened by the end to a band which they could pass round the neck, and then, when in a sitting posture, would have the appearance of being in an envelope of thatch. We found no huts at their camps, and the only shelter they appeared to construct was to lay some sticks across from the branches of one bush to those of another, and lay some green boughs on top, to which they sometimes added grass to shade them from the sun. On the tops of detached conical hills we sometimes found structures of loose stones rudely built in a circle, but open on one side, generally to the n.w. or dry weather quarter; they were built about 3 feet wide and  $2\frac{1}{2}$  feet high; across the top of this wall were laid some dry sticks, which were again covered with a little dry grass. From their being found in such exposed situations and large enough only for a man to sit in cross legged, I judged them to be look-out stations where the natives watched for the kangaroos' coming to favourite spots below.

In April and May, when the grass becomes dry, they burn it off about such water-holes and creeks as the kangaroos frequent; when the grass is thus early burned, the roots being still moist send up a second crop, and this is so sudden that I have seen green grass the third day after the dry was burned. This is done by the native to induce the kangaroos to come to such spots to feed, and be the more convenient for him to hunt.

Their weapons are only spears, and these are of three kinds;



one is a small spear about the length of an arrow, about 3 feet in length, sometimes of wood, pointed, at other times of reed, to which is fixed a long point of wood; these are used for killing birds. The second is a spear about 9 feet long, having a point sometimes neatly made of jasper or siliceous sandstone; these are used for the chase and the fight. The third description of spear is used for taking fish, and they are either barbed or forked, the former for taking large fish by being driven through them, and the latter for taking fish of smaller size by fixing them within the fork; the points of the fork are left blunt and smoothly rounded to prevent their piercing the fish.

The natives on the mainland of Northern Australia have no boats or canoes, the only thing of the sort observed there being a bark canoe, seen by Captain Stokes in the River Adelaide; but on some of the islands fronting the coast they use rude boats hewn from solid logs, across which they fix out-riggers projecting 7 or 8 feet from each side, to the extremities of which are fixed long floats of some light wood parallel with the boat, which prevents the possibility of its being turned over. Up the River Victoria the natives used floats to enable them to cross the river. These floats are composed of one, two, or three stems, according to their size, of a peculiar kind of mangrove tree, that is, when dead or dry, very light and buoyant. The native, after crossing the river on one of these floats, leaves it in a position or place out of reach of the tide, and convenient for the next who may require it. They use these floats in places where they could readily swim across without them, on which occasions I think the float is used as a protection against the attacks of alligators. When I have seen a native cross the river alone, he got apparently astride on his float, having the small end of the log passing down beneath him, and the forward or thick end above water; but when a number cross, as I once saw a tribe (including the women and children) do, they took the float under the left arm. Only once did I see the natives cross without floats, but then they were in some number, which seems to be sufficient security against the cowardly reptile.

In the Gulf of Carpentaria the natives pass from island to island on rafts made of the dead stems of mangrove packed into a kind of flat bundle 6 to 8 feet long,  $2\frac{1}{2}$  feet wide, and 1 foot deep. We discovered three of these rafts on Sweers Island that the natives, apparently only a few hours before, had drawn up on the beach. In other parts of Australia the natives are known to propel their rafts or bark canoes with a spear or with their hands; but here we were astonished to find well-formed paddles with each raft: on an inspection, however, I found that these paddles, though 6 inches broad, and on an average half an inch thick, had grown nearly in the form in which we found them. I took one of

these paddles from a raft that had got two of them, and left a silk handkerchief and a bottle in exchange ; it is now deposited in the British Museum. Mr. Flood afterwards found the tree from which such paddles are made to be a variety of mangrove growing on the margin of the Albert, having four roots striking out from the stem above ground like four edges or blades radiating from a centre, but continuing parallel with and united to the stem for more than a foot before parting ; two of these edges on opposite sides being removed and the other two retained leaves the stem of the little tree in the form of a paddle.

Though the natives of some of the islands along the coast have boats which they hew out of solid logs, and construct them in a manner that enables them to go to considerable distances, I do not think it argues a greater degree of ingenuity for them, but rather that their islands produce more suitable timber for that purpose than does the mainland, and the necessity that impels them to seek their supplies of food in the sea induces the attempt at boat-building.

Having been stationed for a considerable time at the River Victoria I had more frequent intercourse with the natives than any of the other officers of the Expedition, and I am happy to say that, except on one occasion, our intercourse with them was always amicable, and that, on the Lower Victoria at least, there is no impression left on the minds of the native population unfavourable to their English visitors.

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III. — *Journey from Colesberg to Steinkopf in 1854-5.* By  
ROBERT MOFFAT, Esq., F.R.G.S., Government Surveyor at the  
Cape.

Communicated by the COLONIAL OFFICE.

Read, December 14, 1857.

THE following is a narrative of a circuitous journey of about 750 miles from near Colesberg to Steinkopf, in Little Namaqualand, during the months of December, 1854, and January, February, April, and May, 1855, by which I traversed the east, south, and west sides of the tract of territory annexed to the colony by proclamation of 1847. My route lay, on an average, about 20 miles beyond the surveyed lands, or rather the old boundary, which I occasionally touched, leaving to the left the Karree, Hantam, and Langeberg table ranges, and to the right an extensive champaign country, with a few migratory Boers and Bastards adjacent to the road, and towards the north the Bushman horde.

My object in writing this journal is to show, in conjunction with the map, the circumstances under which my examination of the